

## PATENT COOPERATION TREATY

PCT

NOTIFICATION OF THE RECORDING  
OF A CHANGE(PCT Rule 92bis.1 and  
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

HANDLER, Edward, J., III  
Kenyon & Kenyon  
One Broadway  
New York, NY 10004  
ETATS-UNIS D'AMERIQUE

Date of mailing (day/month/year) 13 août 2001 (13.08.01)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference 1947/25	
International application No. PCT/US00/22391	International filing date (day/month/year) 15 août 2000 (15.08.00)

1. The following indications appeared on record concerning:		
<input checked="" type="checkbox"/> the applicant	<input checked="" type="checkbox"/> the inventor	<input type="checkbox"/> the agent
<input type="checkbox"/> the common representative		
Name and Address SKOSKIEWICZ, Andrezej 925 Oak Lane, #3 Menlo Park, CA 94301 United States of America	State of Nationality US	State of Residence US
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	
2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:		
<input type="checkbox"/> the person	<input checked="" type="checkbox"/> the name	<input checked="" type="checkbox"/> the address
<input type="checkbox"/> the nationality		
<input type="checkbox"/> the residence		
Name and Address SKOSKIEWICZ, Andrzej 965 Oak Lane, #3 Menlo Park, CA 94025 United States of America	State of Nationality US	State of Residence US
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3. Further observations, if necessary:		
4. A copy of this notification has been sent to:		
<input checked="" type="checkbox"/> the receiving Office	<input type="checkbox"/> the designated Offices concerned	
<input type="checkbox"/> the International Searching Authority	<input checked="" type="checkbox"/> the elected Offices concerned	
<input checked="" type="checkbox"/> the International Preliminary Examining Authority	<input type="checkbox"/> other:	

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer  Sean Taylor
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

## PATENT COOPERATION TREATY

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## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner  
US Department of Commerce  
United States Patent and Trademark  
Office, PCT  
2011 South Clark Place Room  
CP2/5C24  
Arlington, VA 22202  
ETATS-UNIS D'AMERIQUE  
in its capacity as elected Office

Date of mailing (day/month/year) 10 August 2001 (10.08.01)	
International application No. PCT/US00/22391	Applicant's or agent's file reference 1947/25
International filing date (day/month/year) 15 August 2000 (15.08.00)	Priority date (day/month/year) 27 August 1999 (27.08.99)
Applicant GOLDSTEIN, Mark, R. et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:  
27 March 2001 (27.03.01)

☐ in a notice effecting later election filed with the International Bureau on:  
\_\_\_\_\_

2. The election ☒ was  
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Antonia Muller Telephone No.: (41-22) 338.83.38
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## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

REC'D 20 NOV 2001

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Applicant's or agent's file reference 1947/25		<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US00/22391	International filing date (day/month/year) 15 August 2000 (15.08.2000)	Priority date (day/month/year) 27 August 1999 (27.08.1999)	
International Patent Classification (IPC) or national classification and IPC IPC(7): B41J 5/10 and US Cl.: 400/492, 494			
Applicant GOLDSTEIN TECHNOLOGY PTX LTD.			
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u>3</u> sheets, including this cover sheet.</p> <p><input type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of <u>0</u> sheets.</p> <p>3. This report contains indications relating to the following items:</p> <p>I <input checked="" type="checkbox"/> Basis of the report</p> <p>II <input type="checkbox"/> Priority</p> <p>III <input type="checkbox"/> Non-establishment of report with regard to novelty, inventive step and industrial applicability</p> <p>IV <input type="checkbox"/> Lack of unity of invention</p> <p>V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p>VI <input type="checkbox"/> Certain documents cited</p> <p>VII <input type="checkbox"/> Certain defects in the international application</p> <p>VIII <input type="checkbox"/> Certain observations on the international application</p>			
Date of submission of the demand 27 March 2001 (27.03.2001)		Date of completion of this report 06 November 2001 (06.11.2001)	
Name and mailing address of the IPEA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703)305-3230		Authorized officer <i>John S. Hilten</i> John S. Hilten Telephone No. (703) 308-0956	

Form PCT/IPEA/409 (cover sheet)(July 1998)

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/22391

## I. Basis of the report

## 1. With regard to the elements of the international application:\*

- ☒ the international application as originally filed.
- ☒ the description:  
pages 1-9 as originally filed  
pages NONE, filed with the demand  
pages NONE, filed with the letter of \_\_\_\_\_.
- ☒ the claims:  
pages 10-16, as originally filed  
pages NONE, as amended (together with any statement) under Article 19  
pages NONE, filed with the demand  
pages NONE, filed with the letter of \_\_\_\_\_.
- ☒ the drawings:  
pages 1-3, as originally filed  
pages NONE, filed with the demand  
pages NONE, filed with the letter of \_\_\_\_\_.
- ☐ the sequence listing part of the description:  
pages NONE, as originally filed  
pages NONE, filed with the demand  
pages NONE, filed with the letter of \_\_\_\_\_.

## 2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language \_\_\_\_\_ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

## 3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in printed form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages NONE
- ☐ the claims, Nos. NONE
- ☐ the drawings, sheets/fig NONE

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\*

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.  
PCT/US00/22391**V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. STATEMENT**

Novelty (N)	Claims <u>1-49</u>	YES
	Claims <u>NONE</u>	NO
Inventive Step (IS)	Claims <u>9, 24</u>	YES
	Claims <u>1-8, 10-23, 25-49</u>	NO
Industrial Applicability (IA)	Claims <u>1-49</u>	YES
	Claims <u>NONE</u>	NO

**2. CITATIONS AND EXPLANATIONS**

Claims 1-8, 10-23, and 25-49 lack an inventive step under PCT Article 33(3) as being obvious over Szmanda in view of Pitzer.

Szmanda teaches of an adjustable keyboard having a first keyboard segment (13), a second keyboard segment (14), a joint coupling the segments (19), a locking mechanism (42), a ball (41), a bearing element (40) engaging the ball (41) (Fig. 8), a ball-and-socket joint (19), the ball being affixed to one of the keyboard segments (Fig. 8), the bearing element (40) having a hemispherical surface (Fig. 8), keyboard segments positionable relative to one another to reduce both pronation of a user's wrists and ulnar deviation of a user's wrists (col. 5, lines 30-40).

Szmanda does not teach of the locking mechanism having a cam, lever, pin, or biasing element. Szmanda also does not teach of the joint having a socket element.

Pitzer discloses a locking mechanism having a cam (38, 40), a lever (20), a pin (32), biasing element (22), and a bushing (58).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Szmanda to have the locking mechanism taught by Pitzer, in order to have fast acting engagement and disengagement of the locking mechanism.

This modification would replace the locking mechanism 42 of Szmanda with the locking mechanism of Pitzer.

The locking mechanism (10) of Pitzer joins sheet (50) to sheet (54). The bushing (58) of Pitzer is affixed to sheet (54). As a result of the above mentioned modification to use the locking mechanism of Pitzer to join the keyboard segments of Szmanda the bushing (58) of Pitzer would be affixed to one of the keyboard segments and thus serve as a socket element.

With respect to claims 48-49, Szmanda in view of Pitzer teach of a method of adjusting a keyboard having first and second segments coupled by a joint, comprising: providing a locking mechanism (10) including a lever (20) (Fig. 3 of Pitzer); unlocking the locking mechanism by pivoting the lever (Fig. 2 of Pitzer); moving the first and second segments in at least one plane (claim 8 of Szmanda); locking the locking mechanism by pivoting the lever to thereby lock a position of the first keyboard segment relative to the second keyboard segment (col. 3 lines 37-52 of Pitzer).

Claims 9 and 24 meet the criteria set out in PCT Article 33(2)-(4), because the prior art does not teach or fairly suggest a keyboard device comprising a locking mechanism having a cam and a joint having a ball, where the cam directly contacts the ball.

Claims 1-14 meet the criteria set out in PCT Article 33(4), because the invention is useful to the industry.

----- NEW CITATIONS -----

NONE

(19) World Intellectual Property Organization  
International Bureau



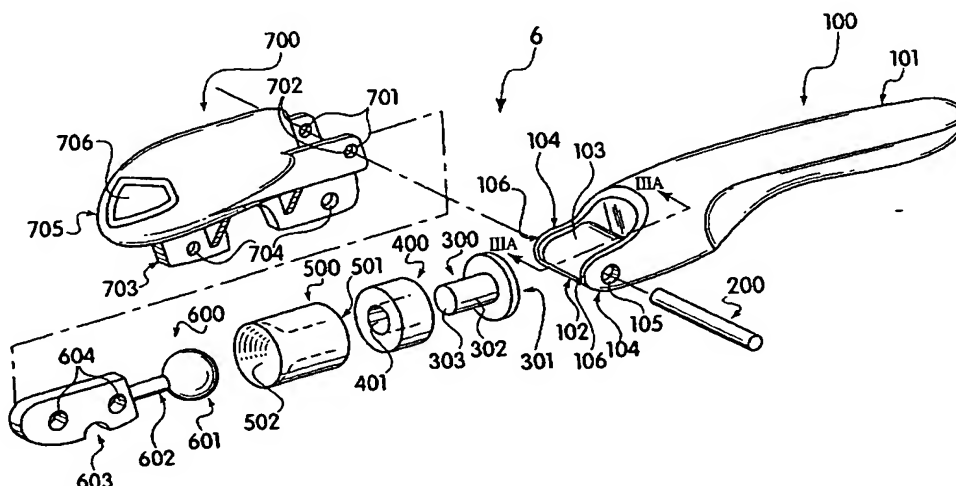
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8 March 2001 (08.03.2001)

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**WO 01/15907 A1**

- (51) International Patent Classification<sup>7</sup>: **B41J 5/10** (74) Agents: **HANDLER, Edward, J., III et al.**; Kenyon & Kenyon, One Broadway, New York, NY 10004 (US).
- (21) International Application Number: **PCT/US00/22391**
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- (26) Publication Language: **English**
- (30) Priority Data:  
09/384,700 27 August 1999 (27.08.1999) **US**
- (71) Applicant (for all designated States except US): **GOLDSTEIN TECHNOLOGY PTY LTD.** [AU/AU]; 45 Clarence Street, Sydney, NSW 2000 (AU).
- (72) Inventors; and  
(75) Inventors/Applicants (for US only): **GOLDSTEIN, Mark, R.** [AU/US]; Apartment 2E, 525 E. 72nd Street, New York, NY 10021 (US); **SKOSKIEWICZ, Andrzej** [US/US]; 965 Oak Lane, #3, Menlo Park, CA 94025 (US); **JUE, Clifford** [US/US]; 111 Ponderosa Court, Santa Cruz, CA 95060 (US); **LAW, David, John** [GB/US]; 10 Cordova Court, Portola Valley, CA 94028 (US).
- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
- Published:  
— With international search report.
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: **ADJUSTABLE KEYBOARD WITH ADJUSTING AND LOCKING MECHANISM, AND METHOD OF ITS USE**



(57) Abstract: The invention relates to an adjustable keyboard to be used, for example, at a computer terminal (12). The preferred embodiment is in the form of a keyboard having a number of keys (5), the keyboard being formed in at least two segments (2, 3) which are mutually movable relative to one another using a hinge or joint (6). Each of the segments (2, 3) of the keyboard has mounted thereon some of the keys (5). The relatively movable nature of the keyboard aims at reducing stress and discomfort to the user by eliminating contortion to the user's wrists. More particularly, discomfort to the user caused by pronation of the wrists and/or ulnar deviation of the wrists is reduced. The hinge or joint (6) may be in the form of a ball and socket-type joint with a locking mechanism, which preferably includes a pivoted handle (100), in the form of a lever, used for locking and unlocking the hinge or joint (6).

WO 01/15907 A1

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US00/22391

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :B41J 5/10

US CL :400/492, 494

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 400/492, 494, 489, 493, 488, 493.1, 82, 485; 361/680; 341/22

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
NONEElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
NONE

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,067,834 A (SZMANDA et al) 26 November 1991 (26.11.1991), figure 6.	1-8, 10-23, 25-49
Y	US 3,709,088 A (PITZER) 09 January 1973 (09.01.1973), figure 2.	1-8, 10-23, 25-49
A	US 5,788,386 A (HAYASHI et al) 04 August 1998 (04.08.1998), see entire document.	1-49
A	US 5,543,790 A (GOLDSTEIN) 06 August 1996 (06.08.1996), see entire document.	1-49
A	US 5,662,422 A (FORT) 02 September 1997 (02.09.1997), see entire document.	1-49
A	US 5,160,165 A (HOBLINGRE) 03 November 1992 (03.11.1992), see entire document.	1-49

☒ Further documents are listed in the continuation of Box C.
 ☐ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier document published on or after the international filing date	"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

21 SEPTEMBER 2000

Date of mailing of the international search report

14 NOV 2000

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## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US00/22391

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,813,258 A (COVA et al) 29 September 1998 (29.09.1998), see entire document.	1-49



3/pst

## **ADJUSTABLE KEYBOARD WITH ADJUSTING AND LOCKING MECHANISM, AND METHOD OF ITS USE**

### **BACKGROUND OF THE INVENTION**

#### **FIELD OF THE INVENTION**

The following invention relates to keyboards, and more particularly to a keyboard formed in two or more mutually pivotable segments which may be adjusted and locked into a number of different ergonomic positions.

#### **DESCRIPTION OF THE PRIOR ART**

Known keyboards of the type used at a computer terminal, for example, generally include a unitary board onto which alphanumeric keys are attached. It is a disadvantage of such known keyboards that the wrists and/or arms and shoulders of an operator must be contorted into a configuration which is stressful to the user after prolonged use of the keyboard. This problem is brought about by the fact that the hands of the user must be turned outwardly by pivoting of the wrists relative to the forearms, resulting in ulnar deviation. Discomfort to the user caused by pronation of the wrists is also a problem with these known keyboards. Pronated posture can also transmit stresses into the neck and shoulders of the user.

It is desirable to reduce pronation and ulnar deviation of the wrists in computer keyboards. To that end, U.S. Patent Nos. 5,424,728 and 5,543,790 describe adjustable keyboards with at least two segments which are movable relative to one another via a hinge or joint. By moving the segments, the orientation of the user's wrists and hands

can be adjusted to allow for reduction of ulnar deviation and pronation of the wrists. The hinge or joint in those patents is disclosed as preferably being a ball and socket-type joint.

U.S. Patent Nos. Des. 362,434 and 5,454,652, assigned to Lexmark and U.S. Patent No. 5,527,116, assigned to Maxi Switch, each show adjustable keyboards including a mechanism for locking the keyboard segments in place. However, in each of the keyboards described in those patents, the locking mechanism includes a large number of parts. As a result, those keyboards can be difficult to manufacture and assemble and therefore can be expensive, and those keyboards can be difficult for the user to adjust and lock.

### SUMMARY OF THE INVENTION

It is the object of the present invention to overcome or substantially ameliorate the disadvantages of the prior art. It is therefore an object of the present invention to provide an adjustable keyboard which is inexpensive and simple to manufacture, is made of few parts and parts which are easy to manufacture and assemble, and which is easy for the user to adjust to a large number of positions.

There is disclosed a keyboard having a plurality of keys, the keyboard having at least two segments which are mutually movable relative to one another, and wherein each segment of the keyboard includes some of the keys. Typically, the keyboard has at least two mutually pivotable segments which are attached to one another at a top end of the keyboard segments by way of a hinge or joint, such that a front edge of the keyboard may spread apart in at least a substantially horizontal plane, to thereby reduce ulnar deviation in the keyboard user. Advantageously, the hinge or joint is adapted to allow pivoting in both horizontal and vertical planes such that the two segments of the keyboard may reside in different planes, so that the center of the keyboard is raised to reduce pronation and therefore decrease tension in the wrists and forearms of the user.

The hinge or joint may preferably be composed of a ball and socket joint which includes a locking mechanism. The locking mechanism may be fashioned using a pivoting handle, in the form of a lever, which includes a cam. The cam may

be used to force bearing surfaces against a ball on a ball element, to thereby frictionally retain the ball and socket joint in a fixed position. Upon pivoting of the handle away from the keyboard, the cam may release the ball from the friction fit with the bearing surfaces, thereby allowing the ball to slide in the socket, and therefore  
5 allowing the keyboard segments to be adjusted relative to one another.

A support may be provided generally below the ball and socket joint so as to maintain the central region of the keyboard at a raised preselected level, if needed.

Beneficially, a number pad region of the keyboard can be provided which is pivotable relative to one of the segments such that the number pad region may reside  
10 in a plane other than the plane of the segment to which the number pad is hinged.

Typically, the keyboard is divided into segments which coincide with generally accepted keyboard areas used by a particular hand.

The present invention provides a keyboard in which the wrists of the operator need not be contorted as they would be in use of a conventional keyboard.

In order to electrically connect the keys of one segment of the keyboard to the other, a cable or any suitable contact may be provided between the two  
15 segments. Additionally, an infrared or other electromagnetic signal may be used to transmit signals from the keyboard to the computing device without the need for a cable or other physical connection.

## 20 BRIEF DESCRIPTION OF THE DRAWINGS

Preferred forms of the present invention will now be described by way of example with reference to the accompanying drawings, wherein:

FIG. 1 is a schematic plan view of a keyboard of the present invention;

25 FIG. 2 is a schematic elevational view of the keyboard of FIG. 1;

FIG. 3 is an exploded perspective view of the components of an embodiment of the hinge or joint and locking mechanism of the present invention;

FIG. 3a is a cross-sectional view, through line IIIA-III A, of the cam of the embodiment of FIG. 3.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention relates to a keyboard 1 to be used, for example, at a computer terminal 12. In the accompanying drawings there is schematically depicted a keyboard generally indicated by reference numeral 1. Keyboard 1 includes separate segments 2, 3, and 4, each having a plurality of keys 5. It is to be understood that the configuration of the keys on segments 2, 3, and 4, may be in any suitable form which allows access to the appropriate hand corresponding to segments 2, 3, and 4, and need not be the configuration shown in FIG. 1.

Segments 2 and 3 of keyboard 1 are mutually attached by a hinge or joint 6, which may provide one or more degrees of freedom of relative movement between segments 2 and 3. Hinge or joint 6 in the preferred embodiments is described in more detail below. As described in more detail below, a handle 100, in the form of a lever, forms a portion of a keyboard locking mechanism. The handle 100 may be pivoted from a locked position, which fixes the position of the hinge or joint 6, to an unlocked position 100' (dashed lines), which allows pivoting movement of the segments 2, 3 relative to one another in one or more planes. The segment 2 or 3 containing the handle 100 may include an indentation 110 near the end of the handle 100 to allow easier access to, and pivoting of, the handle 100 by the user.

Segment 4 of keyboard 1, if provided, has mounted thereon numerical keys 5 and is attached to segment 3 by hinge or joint 7. Hinge or joint 7 may extend along line 8 illustrated in FIG. 1 so as to provide at least one degree of relative movement between segments 3 and 4. Alternatively, a hinge or joint of the type described below may be employed between segments 2 and 3 and may be located at either an upper or lower end of line 8 in FIG. 1. Segment 4 is an optional segment, and the keyboard 1 may be formed of only segments 2 and 3.

It should be appreciated that segments 2 and 3 of keyboard 1 may pivot with respect to one another while each remaining in a single plane (i.e., the plane of FIG. 1), or in multiple planes (i.e., the planes of FIGS. 1 and 2). Movement of the segments 2, 3 in the plane of FIG. 1 acts to prevent or reduce ulnar deviation of the user's hands and wrists, while movement of the segments 2, 3 in the plane of FIG. 2 acts to prevent or reduce pronation of the user's wrists. As depicted in FIG. 2, a center

region of keyboard 1 is raised above the level of a desk 14 on which the keyboard 1 is supported. An optional support (not shown) may be provided generally below the hinge or joint 6 so as to maintain the central region of the keyboard 1 at a raised preselected level, if needed.

5           Should an operator of the keyboard 1 not be comfortable with a hinged-apart orientation of the keyboard 1, the keyboard 1 may simply be returned to a conventional configuration.

10           In order to electrically connect the keys of one segment (e.g. segment 2) to the other (e.g. segment 3), a cable 10 or any suitable contact may be provided between the two segments. Additionally, an infrared or other electromagnetic signal may be used to transmit signals from the keyboard to the computing device without the need for a cable or other physical connection.

15           FIG. 3 shows an exploded view of the components of a first embodiment of a locking mechanism and hinge or joint of the present invention. A handle 100, in the form of a lever, includes a handle section 101 at one end and a cam 102 at another end. Cam 102 includes a cam surface 103. On either side of cam 102 are flanges 104, each of which includes a hole 105. A cam hole 107 passes through cam 102 and is aligned with holes 105. Handle 100 is preferably made of an inexpensive, but relatively rigid, material such as an engineering plastic such as polyketon, sold under  
20           the trade name CARILON.

25           A retaining pin 200 passes through holes 105 and the cam hole 107, to retain handle 100 on socket element 700. Pin 200 is preferably manufactured of an inexpensive and somewhat resilient material, such as an engineering plastic, for example a glass-filled polyamide or nylon, sold under the trade name GRIVORY GV-SH, and has at least one end which is slightly enlarged, so as to allow a press or interference fit between the pin 200 and holes 105, to thereby hold handle 100 and socket element 700 together. Flanges 701 on socket element 700 fit slidably within slots 106 between flanges 104 and cam 102, such that pin 200 fits through holes 105, holes 702 on flanges 701, and the cam hole 107, thereby allowing pivoting of handle  
30           100 relative to socket element 700 about the axis of pin 200.

          A camming pin 300 is retained adjacent to the cam 102. Camming pin 300

includes a camming surface 301 and a pin 302 projecting away from camming surface 301. Pin 302 fits through holes 401 and 501 in biasing element 400 and bearing element 500, respectively, such that bearing element 500, biasing element 400 and camming pin 300 are connected and aligned together. Camming pin 300 is preferably made of an inexpensive, but relatively rigid, material such as an acetal co-polymer or nylon, sold under the trade name DURACON —90.

A biasing element 400 is retained adjacent to the locking pin 300. The biasing element is preferably disc-shaped, and includes a hole 401 passing through its center. Biasing element 400 is preferably made of a relatively resilient material, such as a urethane rubber, or could be made of a spring steel component, so that it acts as a spring to provide a bias against the action of cam 102 during locking and unlocking. The biasing element 400 serves to reduce the need for exacting tolerances in the locking mechanism of the present invention. The biasing element 400 also serves as a clutching mechanism so that if too much pressure is exerted on the keyboard segments 2, 3, the provision of the biasing element 400 allows for slippage between the ball element 600 and socket element 700 described below.

A bearing element 500 is retained adjacent to the biasing element 400. On the end of bearing element 500 adjacent to the biasing element 400, the bearing element 500 includes a hole 501, through which the end of pin 302 passes. The opposite end of bearing element 500 includes a bearing surface 502 which is preferably hemispherical in shape. The bearing element 500 is mounted within socket element 700 for sliding movement relative to both the keyboard segments 2, 3. The bearing element 500 is preferably made of a relatively inexpensive and rigid material, such as an acetal copolymer, sold under the trade name DURACON M-90.

A ball element 600 is mounted adjacent to the bearing element 500. A ball 601 on ball element 600 fits within, and is slidably mounted against, bearing surface 502. A shaft 602 connects ball 601 to a retaining portion 603 of ball element 600. Retaining portion 603 may include one or more holes 604, which are used to affix ball element 600 to one of the keyboard segments 2, 3 or 4, via suitable attachment mechanisms such as screws or bolts. The ball element 600, although shown as spherical in the drawings, could alternatively be hemispherical in shape. The ball

element 600 is preferably made of a relatively inexpensive and rigid material, such as a glass or mineral filled acetal copolymer, or alternatively could be fabricated of stainless steel. In an alternative embodiment of the invention, the cam surface 103 may provide direct contact with the ball element 600, thereby eliminating the need for the bearing element 500 and biasing element 400.

Ball 601 fits within a socket element 700, such that the shaft 602 and retaining portion 603 project out of an opening 706 in socket element 700. An interior bearing surface of socket element 700, at socket end 705, is hemispherical in shape. Ball 601 on ball element 600 fits within, and is slidably mounted against, the bearing surface within socket end 705. Socket element 700 includes flanges 701, which are spaced and shaped so as to slidably fit within slots 106 on handle 100. Holes 702 on flanges 701 are spaced to align with holes 105 on handle 100, and the cam hole on handle 100, so that the pin 200 can fit through those holes, allowing the handle 100 to be pivoted relative to socket element 700. Socket element 700 may also include a flange 703 with one or more holes 704, which are used to affix socket element 700 to one of the keyboard segments 2, 3 or 4 -- adjacent the segment 2, 3 or 4 to which ball element 600 is affixed -- via suitable attachment mechanisms such as screws or bolts. The socket element 700 is preferably made of a relatively inexpensive and rigid material, such as a glass or mineral filled acetal copolymer, or alternatively could be fabricated of metal.

Operation and manipulation of the keyboard 1 of the present invention will now be described. When it is desired to set a new position of the keyboard 1 segments 2 and 3 relative to one another, the handle 100 is pivoted to its unlocked position 100'. Pivoting of the handle 100 is accomplished by rotating handle 100 about pin 200, thereby moving cam 102 relative to camming surface 301. In the unlocked position 100', the cam surface 103 is spaced a shorter distance  $d_1$  from the axis of pin 200 than the distance  $d_2$  of cam surface 103 from the axis of pin 200 in the locked position. As a result, in the locked position, the cam 102 pushes the camming pin 300 in the direction of the ball element 600, and in the unlocked position 100', the cam 102 allows camming pin 300 a degree of movement away from ball element 600, under the influence of biasing element 400.

In the unlocked position 100' the bias of biasing element 400 allows camming pin 300 to move in the direction away from ball element 600. This movement also allows movement of the bearing element 500 away from the ball element 600. As a result, the ball 601 is unclamped between the bearing surface 502 and the bearing surface inside the socket end 705, allowing the ball 601 to rotate between those surfaces. Rotation of the ball 601 is effected by pivoting movement, in one or more planes, of the segments 2, 3 relative to one another, one of the segments 2, 3 being affixed to the retaining portion 603 projecting out of opening 706 in socket element 700, and the other segment 2, 3 being affixed to socket element 700.

When the segments are unlocked by moving handle 100 to unlocked position 100', the segments 2, 3 may be pivoted in a horizontal plane (i.e., the plane of FIG. 1) relative to one another to reduce or eliminate ulnar deviation in the user's hands and wrists. The segments 2, 3 may also be pivoted in a vertical plane (i.e., the plane of FIG. 2) relative to one another to reduce or eliminate pronation in the user's wrists.

After a desired orientation of the segments 2, 3 relative to one another is achieved, the handle 100 is pivoted around pin 200 to its locked position, thereby moving cam 102 relative to camming surface 301. In the locked position, the cam surface 103 is spaced a longer distance  $d_1$  from the axis of pin 200 than the distance  $d_2$  of cam surface 103 from the axis of pin 200 in the unlocked position. As a result, in the locked position, the cam 102 pushes the camming pin 300 in the direction of the ball element 600. In the locked position, the camming pin 300 moves in the direction toward ball element 600. This movement pushes the biasing element 400, and thus the bearing element 500, toward the ball element 600. As a result, the ball 601 is clamped between the bearing surface 502 and the bearing surface inside the socket end 705, fixing the ball 601 against rotation between those surfaces as the result of frictional forces. The segments 2, 3 are thus fixed in position relative to one another, as a result of the clamping of ball 601 between the bearing surface 502 and the bearing surface inside the socket end 705, as well as fixing of one of the segments 2, 3 to the retaining portion 603 and the other segment 2, 3 to socket element 700.

While the forgoing represents a description of preferred embodiments of the invention, it is to be understood that the claims below recite the features of the present



invention, and that other embodiments, not specifically described hereinabove, fall within the scope of the present invention.

**CLAIMS**

What is claimed is:

1. A keyboard comprising:
  - a first keyboard segment, the first keyboard segment including keys;
  - a second keyboard segment, the second keyboard segment including keys; and
  - a joint coupling the first keyboard segment and the second keyboard segment, the joint allowing movement of the first keyboard segment and the second keyboard segment relative to one another, the joint including a locking mechanism, the locking mechanism locking a position of the first keyboard segment relative to the second keyboard segment, the locking mechanism including a cam.
2. The keyboard of claim 1, wherein:
  - the locking mechanism includes a lever movable from a locking position to an unlocking position, the lever moving the cam.
3. The keyboard of claim 2, wherein:
  - the lever is pivotally mounted on a pin.
4. The keyboard of claim 1, wherein:
  - the locking mechanism includes a bearing element, the cam being connected to the bearing element, movement of the cam causing movement of the bearing element.
5. The keyboard of claim 4, wherein:
  - the joint includes a ball, the bearing element engaging the ball in a locked position to lock the first segment relative to the second segment.

6. The keyboard of claim 1, wherein:  
the joint is a ball-and-socket joint.
7. The keyboard of claim 1, wherein:  
the locking mechanism includes a biasing element, the biasing element  
biasing the cam and lever.
8. The keyboard of claim 1, wherein:  
the joint includes a ball, the ball being affixed to one of the keyboard  
segments.
9. The keyboard of claim 8, wherein:  
the cam directly contacts the ball.
10. The keyboard of claim 8, wherein:  
the ball is hemispherical.
11. The keyboard of claim 1, wherein:  
the joint includes a socket element, the socket element being affixed to  
one of the keyboard segments.
12. The keyboard of claim 11, wherein:  
the joint includes a ball, the ball being affixed to another of the  
keyboard segments.
13. The keyboard of claim 1, wherein:  
the locking mechanism includes a movable bearing element.
14. The keyboard of claim 13, wherein:  
the movable bearing element has a hemispherical surface.

**15. The keyboard of claim 1, wherein:**

**the first keyboard segment and the second keyboard segment are positionable relative to one another to reduce pronation of a user's wrists.**

**16. The keyboard of claim 1, wherein:**

**the first keyboard segment and the second keyboard segment are positionable relative to one another to reduce ulnar deviation of a user's wrists,**

**17. The keyboard of claim 1, wherein:**

**the joint is adapted to allow pivoting of the first keyboard segment and the second keyboard segment in both horizontal and vertical directions.**

**18. A keyboard comprising:**

**a first keyboard segment, the first keyboard segment including keys;**

**a second keyboard segment, the second keyboard segment including keys; and**

**a joint coupling the first keyboard segment and the second keyboard segment, the joint allowing movement of the first keyboard segment and the second keyboard segment relative to one another, the joint including a locking mechanism, the locking mechanism locking a position of the first keyboard segment relative to the second keyboard segment, the locking mechanism including a lever movable from a locking position to an unlocking position.**

**19. The keyboard of claim 18, wherein:**

**the locking mechanism includes a bearing element and a cam, the cam being connected to the bearing element, movement of the cam causing movement of the bearing element.**

20. The keyboard of claim 18, wherein:  
the joint includes a ball and a bearing element, the bearing element engaging the ball in the locked position to lock the first segment relative to the second segment.
21. The keyboard of claim 18, wherein:  
the joint is a ball-and-socket joint.
22. The keyboard of claim 19, wherein:  
the locking mechanism includes a biasing element, the biasing element biasing the cam and lever.
23. The keyboard of claim 18, wherein:  
the joint includes a ball, the ball being affixed to one of the keyboard segments.
24. The keyboard of claim 23, further comprising:  
a cam, the cam directly contacting the ball.
25. The keyboard of claim 23, wherein:  
the ball is hemispherical.
26. The keyboard of claim 18, wherein:  
the joint includes a socket element, the socket element being affixed to one of the keyboard segments.
27. The keyboard of claim 26, wherein:  
the joint includes a ball, the ball being affixed to another of the keyboard segments.

28. The keyboard of claim 18, wherein:  
the locking mechanism includes a movable bearing element.
29. The keyboard of claim 28, wherein:  
the movable bearing element has a hemispherical surface.
30. The keyboard of claim 18, wherein:  
the first keyboard segment and the second keyboard segment are positionable relative to one another to reduce pronation of a user's wrists.
31. The keyboard of claim 18, wherein:  
the first keyboard segment and the second keyboard segment are positionable relative to one another to reduce ulnar deviation of a user's wrists.
32. The keyboard of claim 18, wherein:  
the joint is adapted to allow pivoting of the first keyboard segment and the second keyboard segment in both horizontal and vertical directions.
33. A keyboard comprising:  
a first keyboard segment, the first keyboard segment including keys;  
a second keyboard segment, the second keyboard segment including keys; and  
a joint coupling the first keyboard segment and the second keyboard segment, the joint allowing movement of the first keyboard segment and the second keyboard segment relative to one another, the joint including a locking mechanism, the locking mechanism locking a position of the first keyboard segment relative to the second keyboard segment, the locking mechanism including a movable bearing element movable relative to the first keyboard segment and the second keyboard segment.

34. The keyboard of claim 33, wherein:  
the movable bearing element has a hemispherical surface.
35. The keyboard of claim 34, wherein:  
the locking mechanism includes a lever movable from a locking position to an unlocking position.
36. The keyboard of claim 33, wherein:  
the locking mechanism includes a cam.
37. The keyboard of claim 36, wherein:  
the cam is connected to the bearing element, movement of the cam causing movement of the bearing element.
38. The keyboard of claim 33, wherein:  
the joint includes a ball, the bearing element engaging the ball in a locked position to lock the first segment relative to the second segment.
39. The keyboard of claim 33, wherein:  
the joint is a ball-and-socket joint.
40. The keyboard of claim 33, wherein:  
the locking mechanism includes a biasing element.
41. The keyboard of claim 33, wherein:  
the joint includes a ball, the ball being affixed to one of the keyboard segments.
42. The keyboard of claim 41, wherein:  
the ball is hemispherical.

43. The keyboard of claim 33, wherein:  
the joint includes a socket element, the socket element being affixed to one of the keyboard segments.
44. The keyboard of claim 43, wherein:  
the joint includes a ball, the ball being affixed to another of the keyboard segments.
45. The keyboard of claim 33, wherein:  
the first keyboard segment and the second keyboard segment are positionable relative to one another to reduce pronation of a user's wrists.
46. The keyboard of claim 33, wherein:  
the first keyboard segment and the second keyboard segment are positionable relative to one another to reduce ulnar deviation of a user's wrists.
47. The keyboard of claim 33, wherein:  
the joint is adapted to allow pivoting of the first keyboard segment and the second keyboard segment in both horizontal and vertical directions.
48. A method of adjusting a keyboard having first and second segments coupled by a joint, comprising:  
providing a locking mechanism including a lever;  
unlocking the locking mechanism by pivoting the lever;  
moving the first and second segments in at least one plane;  
locking the locking mechanism by pivoting the lever to thereby lock a position of the first keyboard segment relative to the second keyboard segment.
49. The method of claim 48, wherein:  
the first and second segments are moved in two planes.



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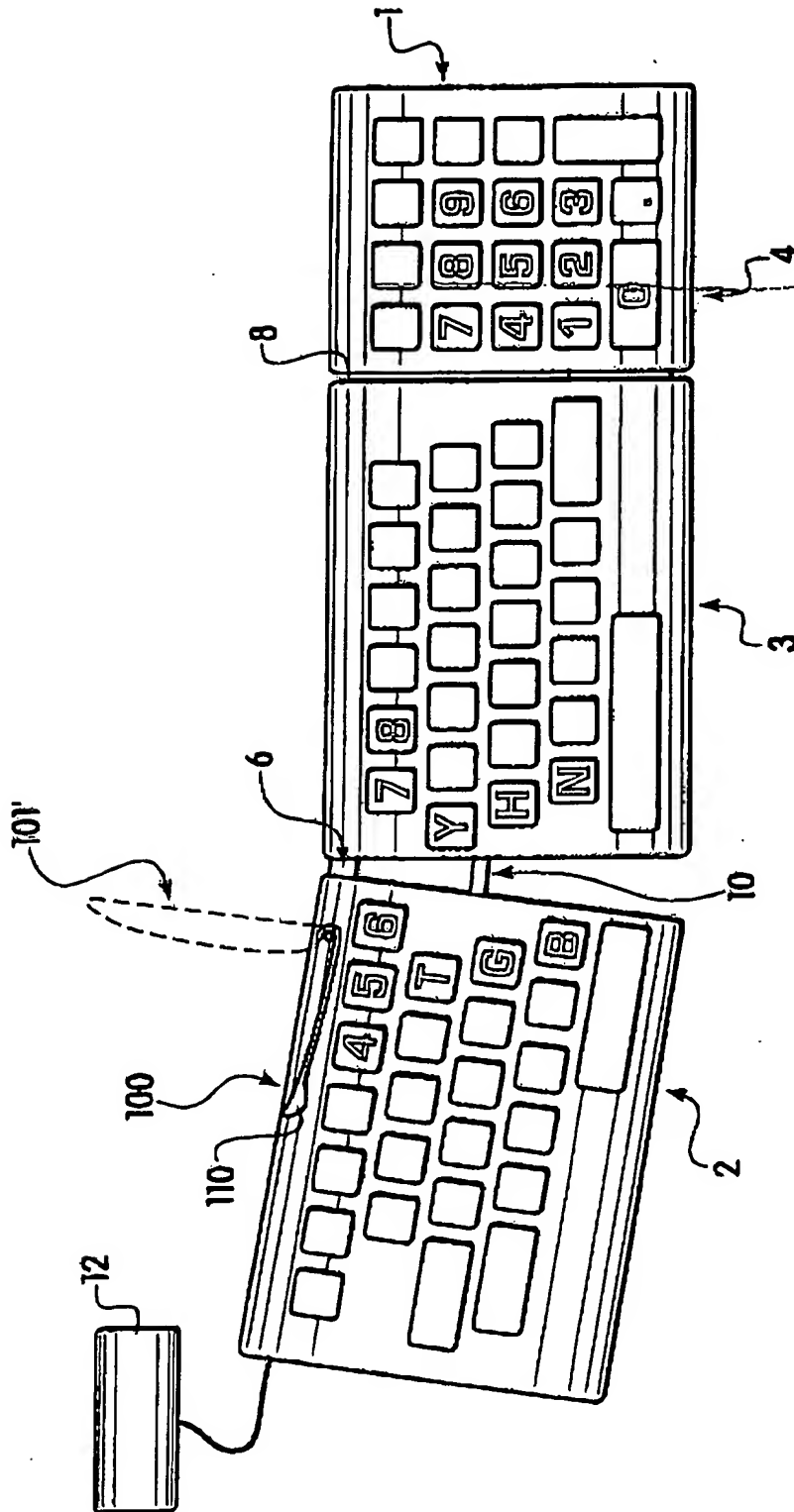


FIG. 1

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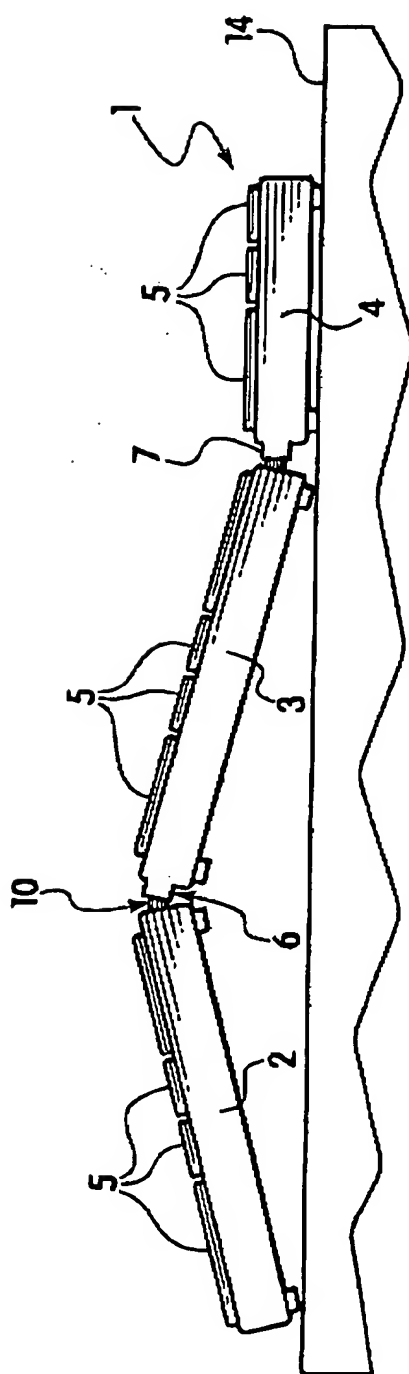
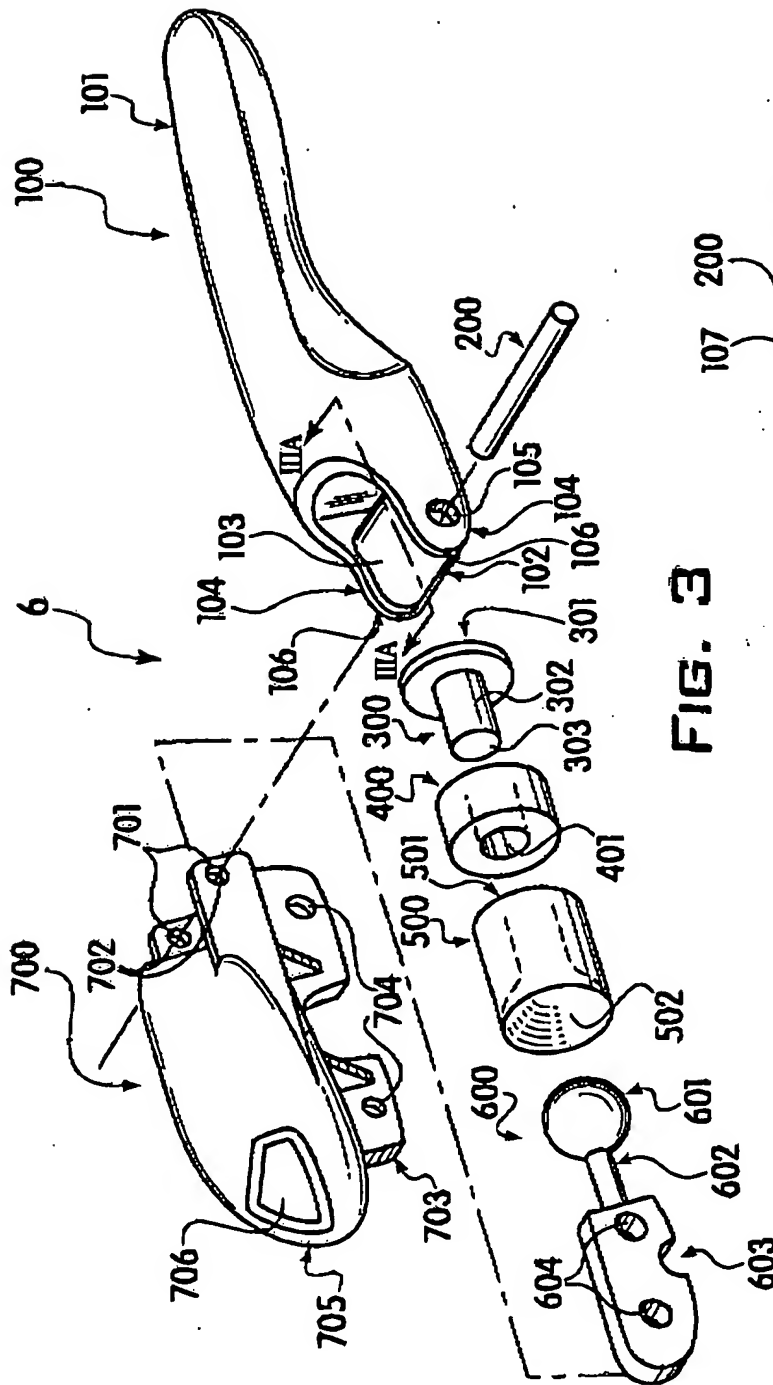
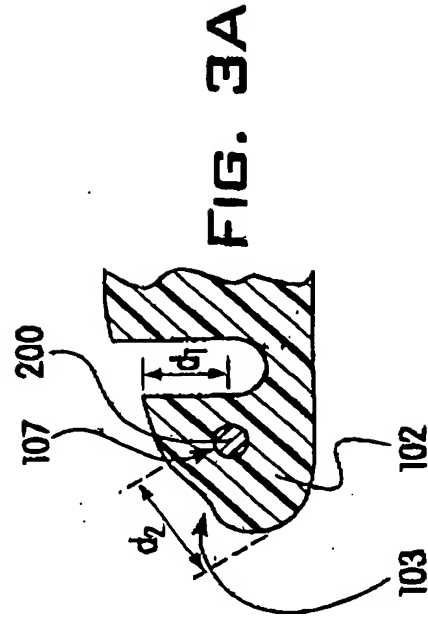


FIG. 2



三



**FIG. 3A**

# PATENT COOPERATION TREATY

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## PCT

### NOTIFICATION OF TRANSMITTAL OF INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Rule 71.1)

Applicant's or agent's file reference 1947/25		Date of Mailing (day/month/year) <b>16 NOV 2001</b>
<b>IMPORTANT NOTIFICATION</b>		
International application No. PCT/US00/22391	International filing date (day/month/year) 15 August 2000 (15.08.2000)	Priority date (day/month/year) 27 August 1999 (27.08.1999)
Applicant  GOLDSTEIN TECHNOLOGY PTX LTD.		

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.
4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

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## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 1947/25		<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US00/22391	International filing date (day/month/year) 15 August 2000 (15.08.2000)	Priority date (day/month/year) 27 August 1999 (27.08.1999)	
International Patent Classification (IPC) or national classification and IPC IPC(7): B41J 5/10 and US Cl.: 400/492, 494			
Applicant GOLDSTEIN TECHNOLOGY PTX LTD.			
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u>3</u> sheets, including this cover sheet.</p> <p><input type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of <u>0</u> sheets.</p>			
<p>3. This report contains indications relating to the following items:</p> <p>I <input checked="" type="checkbox"/> Basis of the report</p> <p>II <input type="checkbox"/> Priority</p> <p>III <input type="checkbox"/> Non-establishment of report with regard to novelty, inventive step and industrial applicability</p> <p>IV <input type="checkbox"/> Lack of unity of invention</p> <p>V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p>VI <input type="checkbox"/> Certain documents cited</p> <p>VII <input type="checkbox"/> Certain defects in the international application</p> <p>VIII <input type="checkbox"/> Certain observations on the international application</p>			
Date of submission of the demand 27 March 2001 (27.03.2001)		Date of completion of this report 06 November 2001 (06.11.2001)	
Name and mailing address of the IPEA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703)305-3230		Authorized officer <u>Sam S. Hilten</u> John S. Hilten Telephone No. (703) 308-0956	

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US00/22391

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :B41J 5/10

US CL :400/492, 494

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 400/492, 494, 489, 493, 488, 493.1, 82, 485; 361/680; 341/22

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
NONEElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
NONE

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	✓ US 5,067,834 A (SZMANDA et al) 26 November 1991 (26.11.1991), figure 6.	1-8, 10-23, 25-49
Y	✓ US 3,709,088 A (PITZER) 09 January 1973 (09.01.1973), figure 2.	1-8, 10-23, 25-49
A	✓ US 5,788,386 A (HAYASHI et al) 04 August 1998 (04.08.1998), see entire document.	1-49
A	✓ US 5,543,790 A (GOLDSTEIN) 06 August 1996 (06.08.1996), see entire document.	1-49
A	✓ US 5,662,422 A (FORT) 02 September 1997 (02.09.1997), see entire document.	1-49
A	✓ US 5,160,165 A (HOBLINGRE) 03 November 1992 (03.11.1992), see entire document.	1-49

☒ Further documents are listed in the continuation of Box C.
 ☐ See patent family annex.

* Special categories of cited documents:	* T	later document published after the international filing date or priority date and not in conflict with the application but cited to underpin the principle or theory underlying the invention
* A document defining the general state of the art which is not considered to be of particular relevance	* X	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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* L documents which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	* A	document member of the same patent family
* O documents referring to an oral disclosure, use, exhibition or other means		
* P documents published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search

21 SEPTEMBER 2000

Date of mailing of the international search report

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## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US00/22391

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	✓ US 5,813,258 A (COVA et al) 29 September 1998 (29.09.1998). see entire document.	1-49